What Is Claimed Is:

1. A method for down-converting an electromagnetic signal, comprising the steps of:

(1) performing a matched filtering/correlating operation on a portion of a carrier signal;

(2) accumulating the result of the matched filtering/correlating operation of step (1); and

(3) repeating steps (1) and (2) for additional portions of the carrier signal, whereby the accumulation results form a down-converted signal.

2. The method according to claim 1, wherein step (1) comprises the step of convolving an approximate half cycle of the carrier signal with a representation of itself.

3. The method according to claim 1, wherein step (1) comprises the step of multiplying an approximate half cycle of the carrier signal by itself over a predetermined time interval and integrating over a predetermined time interval.

4. The method according to claim 1, where $S_0(t)$ is an output of the matched filtering/correlating operation, k is a constant, $S_i(t)$ is an approximate half cycle of the carrier signal, and t_0-0 is a predetermined time interval, and wherein step (1) comprises the step of processing an approximate half cycle of the carrier signal in accordance with:

$$S_0(t) = k\int_0^{t_0} S_i^2(t)\,dt\,.$$

5. The method according to claim 1, where $S_0(t)$ is an output of the matched filtering/correlating operation, k is a constant, $kS_i(t_0-\tau)$ is an impulse response of a matched filtering/correlating operator, t_0 is a predetermined observation time, $u(\tau)$ is a step function, and $S_i(t-\tau)$ is an approximate half cycle of the carrier signal, and wherein step (1) comprises the step of processing the approximate half cycle of the carrier signal in accordance with:

$$S_0(t) = \int_0^{\infty} \left(kS_i\left(t_0 - \tau\right)u(\tau)\right)S_i(t - \tau)d\tau .$$

6. The method according to claim 1, wherein step (2) comprises the step of transferring a portion of the energy contained in an approximate half cycle of the carrier signal to an energy storage device.

7. The method according to claim 1, wherein step (2) comprises the step of transferring a portion of the energy contained in an approximate half cycle of the carrier signal to a capacitive storage device.

8. The method according to claim 1, further comprising the step of:

(4) passing on the accumulation result of step (2) to a reconstruction filter.

9. The method according to claim 1, further comprising the step of:

(4) passing on the accumulation result of step (2) to an interpolation filter.

10. The method according to claim 1, wherein step (3) comprises the step of repeating steps (1) and (2) at a sub-harmonic rate of the carrier signal.

11. The method according to claim 1, wherein step (3) comprises the step of repeating steps (1) and (2) at an off-set of a sub-harmonic rate of the carrier signal.

12. The method according to claim 1, further comprising the step of:

(4) performing steps (1), (2), and (3) for positive approximate half cycles of the carrier signal and for inverted negative approximate half cycles of the carrier signal.

13. A method for down-converting an electromagnetic signal, comprising the steps of:

(1) performing a finite time integrating operation on a portion of a carrier signal;

(2) accumulating the result of the finite time integrating operation of step (1); and

(3) repeating steps (1) and (2) for additional portions of the carrier signal, whereby the accumulation results form a down-converted signal.

14. The method according to claim 13, wherein step (1) comprises the step of operating on an approximate half cycle of the carrier signal with a filter having an approximately rectangular impulse response and integrating the output of the filter.

15. The method according to claim 13, wherein step (1) comprises the step of controlling a switch to pass an approximate half cycle of the carrier signal through the switch and integrating the output of the switch.

16. The method according to claim 13, where D_1 is a transform, $u(t)$-$u(t$-$T_A)$ is a windowing operator or aperture of duration T_A, and $A\sin(\varpi t + \phi)$ is an approximate half cycle of the carrier signal, and wherein step (1) comprises the step of processing the approximate half cycle of the carrier signal in accordance with:

$$\mathcal{D}_1 = \int_0^{T_A} \left(u(t) - u(t - T_A)\right) \cdot A\sin(\omega t + \phi) dt$$

17. The method according to claim 13, wherein step (2) comprises the step of transferring a portion of the energy contained in an approximate half cycle of the carrier signal to an energy storage device.

18. The method according to claim 13, wherein step (2) comprises the step of transferring a portion of the energy contained in an approximate half cycle of the carrier signal to a capacitive storage device.

19. The method according to claim 13, where E is energy, A is a constant, $A \cdot S_i(t)$ is an aperture impulse response of duration T_A, and wherein step (2) comprises the step of accumulating energy from an approximate half cycle of the carrier signal in accordance with:

$$E = \left(\int_0^{T_A} A \cdot S_i(t) \right)^2 dt .$$

20. The method according to claim 13, further comprising the step of:

(4) passing on the accumulation result of step (2) to a reconstruction filter.

21. The method according to claim 13, further comprising the step of:

(4) passing on the accumulation result of step (2) to an interpolation filter.

22. The method according to claim 13, wherein step (3) comprises the step of repeating steps (1) and (2) at a sub-harmonic rate of the carrier signal.

23. The method according to claim 13, wherein step (3) comprises the step of repeating steps (1) and (2) at an off-set of a sub-harmonic rate of the carrier signal.

24. The method according to claim 13, further comprising the step of:

(4) performing steps (1), (2), and (3) for positive approximate half cycles of the carrier signal and for inverted negative approximate half cycles of the carrier signal.

25. A method for down-converting an electromagnetic signal, comprising the steps of:

(1) performing an RC processing operation on a portion of a carrier signal;

(2) accumulating the result of the RC processing operation of step (1); and

(3) repeating steps (1) and (2) for additional portions of the carrier signal, whereby the accumulation results form a down-converted signal.

26. The method according to claim 25, wherein step (1) comprises the step of operating on an approximate half cycle of the carrier signal with an RC filter and integrating the output of the RC filter.

27. The method according to claim 25, where h(t) is an impulse response of an RC filter, R is an impedance, C is a capacitance, and $u(\tau)$-$u(\tau$-$T_A)$ is a windowing operator or aperture of duration T_A, and wherein step (1) comprises the steps of:

(a) operating on an approximate half cycle of the carrier signal with an RC filter having an impulse response approximated by

$$h(t) = \frac{e^{\frac{-\tau}{RC}}}{RC}\left[u(\tau) - u(\tau - T_A)\right], \text{ and}$$

(b) integrating the output of the RC filter.

28. The method according to claim 25, wherein step (1) comprises the step of controlling a switch to pass an approximate half cycle of the carrier signal through the switch and integrating the output of the switch using a capacitive storage device.

29. The method according to claim 25, wherein step (2) comprises the step of transferring a portion of the energy contained in an approximate half cycle of the carrier signal to a capacitive storage device.

30. The method according to claim 25, where C is a capacitance, R_S is a source impedance, and T_A is a time of an approximate half cycle of the carrier signal, and wherein step (2) comprises the step of accumulating a portion of the energy contained in the approximate half cycle of the carrier signal using a capacitive storage device chosen in accordance with:

$$C \geq \frac{T_A}{R_S(0.25)}.$$

31. The method according to claim 25, further comprising the step of:

(4) passing on the accumulation result of step (2) to a reconstruction filter.

32. The method according to claim 25, further comprising the step of:

(4) passing on the accumulation result of step (2) to an interpolation filter.

33. The method according to claim 25, wherein step (3) comprises the step of repeating steps (1) and (2) at a sub-harmonic rate of the carrier signal.

34. The method according to claim 25, wherein step (3) comprises the step of repeating steps (1) and (2) at an off-set of a sub-harmonic rate of the carrier signal.

35. The method according to claim 25, further comprising the step of:

(4) performing steps (1), (2), and (3) for positive approximate half cycles of the carrier signal and for inverted negative approximate half cycles of the carrier signal.

36. A system for down-converting an electromagnetic signal, comprising:

a first matched filtering/correlating module that receives an input signal, wherein said first matched filtering/correlating module down-converts said input signal according to a first control signal and outputs a first down-converted signal;

a second matched filtering/correlating module that receives said input signal, wherein said second matched filtering/correlating module down-converts said input signal according to a second control signal and outputs a second down-converted signal; and

a first subtractor module that subtracts said second down-converted signal from said first down-converted signal and outputs a first channel down-converted signal.

37. The system of claim 36, wherein said input signal is a RF carrier signal that is AM, FM, or PM modulated with an information signal.

38. The system of claim 37, wherein said first channel down-converted signal is a baseband signal.

39. The system of claim 37, wherein said first channel down-converted signal is an intermediate frequency signal.

40. The system of claim 36, further comprising:

a third matched filtering/correlating module that receives an input signal, wherein said third matched filtering/correlating module down-converts said input signal according to a third control signal and outputs a third down-converted signal;

a fourth matched filtering/correlating module that receives said input signal, wherein said fourth matched filtering/correlating module down-converts said input signal according to a fourth control signal and outputs a fourth down-converted signal; and

a second subtractor module that subtracts said fourth down-converted signal from said third down-converted signal and outputs a second channel down-converted signal.

41. The system of claim 40, wherein said first subtractor and said second subtractor each comprise a differential amplifier.

42. The system of claim 40, further comprising:

a first filter that filters said first down-converted signal;

a second filter that filters said second down-converted signal;

a third filter that filters said third down-converted signal; and

a fourth filter that filters said fourth down-converted signal.

43. The system of claim 42, wherein said first, second, third, and fourth filters each comprise a low-pass filter.

44. The system of claim 43, wherein each said low-pass filter comprises a resistor and a capacitor.

45. The system of claim 40, further comprising a low-noise amplifier that amplifies said input signal.

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46. The system of claim 40, wherein said input signal comprises an RF I/Q modulated signal.

47. The system of claim 46, wherein said first channel down-converted signal comprises an I-phase information signal portion of said RF I/Q modulated signal, and wherein said second channel down-converted signal comprises a Q-phase information signal portion of said RF I/Q modulate signal.

48. The system of claim 47, wherein a second control signal pulse of said second control signal occurs 1.5 cycles of a frequency of said input signal after the occurrence of a first control signal pulse of said first control signal;

wherein a fourth control signal pulse of said fourth control signal occurs 1.5 cycles of said frequency of said input signal after the occurrence of a third control signal pulse of said fourth control signal; and

wherein said third control signal pulse occurs .75 cycles of said frequency of said input signal after the occurrence of said first control signal pulse.

49. A system for down-converting an electromagnetic signal, comprising:

a first finite time integrating module that receives an input signal, wherein said first finite time integrating module down-converts said input signal according to a first control signal and outputs a first down-converted signal;

a second finite time integrating module that receives said input signal, wherein said second finite time integrating module down-converts said input signal according to a second control signal and outputs a second down-converted signal; and

a first subtractor module that subtracts said second down-converted signal from said first down-converted signal and outputs a first channel down-converted signal.

50. The system of claim 49, wherein said input signal is a RF carrier signal that is AM, FM, or PM modulated with an information signal.

51. The system of claim 50, wherein said first channel down-converted signal is a baseband signal.

52. The system of claim 50, wherein said first channel down-converted signal is an intermediate frequency signal.

53. The system of claim 49, further comprising:

a third finite time integrating module that receives an input signal, wherein said third finite time integrating module down-converts said input signal according to a third control signal and outputs a third down-converted signal;

a fourth finite time integrating module that receives said input signal, wherein said fourth finite time integrating module down-converts said input signal

signal according to a fourth control signal and outputs a fourth down-converted signal; and

a second subtractor module that subtracts said fourth down-converted signal from said third down-converted signal and outputs a second channel down-converted signal.

54. The system of claim 53, wherein said first subtractor and said second subtractor each comprise a differential amplifier.

55. The system of claim 53, further comprising:

a first filter that filters said first down-converted signal;

a second filter that filters said second down-converted signal;

a third filter that filters said third down-converted signal; and

a fourth filter that filters said fourth down-converted signal.

56. The system of claim 55, wherein said first, second, third, and fourth filters each comprise a low-pass filter.

57. The system of claim 56, wherein each said low-pass filter comprises a resistor and a capacitor.

58. The system of claim 53, further comprising a low-noise amplifier that amplifies said input signal.

59. The system of claim 53, wherein said input signal comprises an RF I/Q modulated signal.

60. The system of claim 59, wherein said first channel down-converted signal comprises an I-phase information signal portion of said RF I/Q modulated signal, and wherein said second channel down-converted signal comprises a Q-phase information signal portion of said RF I/Q modulate signal.

61. The system of claim 60, wherein a second control signal pulse of said second control signal occurs 1.5 cycles of a frequency of said input signal after the occurrence of a first control signal pulse of said first control signal;

wherein a fourth control signal pulse of said fourth control signal occurs 1.5 cycles of said frequency of said input signal after the occurrence of a third control signal pulse of said fourth control signal; and

wherein said third control signal pulse occurs .75 cycles of said frequency of said input signal after the occurrence of said first control signal pulse.

62. A system for down-converting an electromagnetic signal, comprising:

a first finite time integrating module that receives an input signal, wherein said first finite time integrating module down-converts said input signal according to a first control signal and outputs a first down-converted signal;

a second finite time integrating module that receives said input signal, wherein said second finite time integrating module down-converts said input signal according to a second control signal and outputs a second down-converted signal; and

a first subtractor module that subtracts said second down-converted signal from said first down-converted signal and outputs a first channel down-converted signal.

63. The system of claim 62, wherein said input signal is a RF carrier signal that is AM, FM, or PM modulated with an information signal.

64. The system of claim 63, wherein said first channel down-converted signal is a baseband signal.

65. The system of claim 63, wherein said first channel down-converted signal is an intermediate frequency signal.

66. The system of claim 62, further comprising:

a third finite time integrating module that receives an input signal, wherein said third finite time integrating module down-converts said input signal according to a third control signal and outputs a third down-converted signal;

a fourth finite time integrating module that receives said input signal, wherein said fourth finite time integrating module down-converts said input signal according to a fourth control signal and outputs a fourth down-converted signal; and

a second subtractor module that subtracts said fourth down-converted signal from said third down-converted signal and outputs a second channel down-converted signal.

67. The system of claim 66, wherein said first subtractor and said second subtractor each comprise a differential amplifier.

68. The system of claim 66, further comprising:

a first filter that filters said first down-converted signal;

a second filter that filters said second down-converted signal;

a third filter that filters said third down-converted signal; and

a fourth filter that filters said fourth down-converted signal.

69. The system of claim 68, wherein said first, second, third, and fourth filters each comprise a low-pass filter.

70. The system of claim 69, wherein each said low-pass filter comprises a resistor and a capacitor.

71. The system of claim 66, further comprising a low-noise amplifier that amplifies said input signal.

72. The system of claim 66, wherein said input signal comprises an RF I/Q modulated signal.

73. The system of claim 72, wherein said first channel down-converted signal comprises an I-phase information signal portion of said RF I/Q modulated signal, and wherein said second channel down-converted signal comprises a Q-phase information signal portion of said RF I/Q modulate signal.

74. The system of claim 73, wherein a second control signal pulse of said second control signal occurs 1.5 cycles of a frequency of said input signal after the occurrence of a first control signal pulse of said first control signal;

wherein a fourth control signal pulse of said fourth control signal occurs 1.5 cycles of said frequency of said input signal after the occurrence of a third control signal pulse of said fourth control signal; and

wherein said third control signal pulse occurs .75 cycles of said frequency of said input signal after the occurrence of said first control signal pulse.

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